Dietary Diversity Score and Associated Factors among High School Adolescent Girls in Gurage Zone, Southwest Ethiopia

Meron Worku[1], Gebremariam Hailemicael[2,*], Asegedech Wondmu[3]

[1]Department of human nutrition, collage of medicine and health sciences, Wolkite University, Wolkite, Ethiopia
[2]Department of Health Policies and Management, collage of medicine and health sciences, Wolkite University, Wolkite, Ethiopia
[3] Department of public health, Wolkite University, Wolkite, Ethiopia
*Corresponding author: ghaile81@yahoo.com

Abstract **Introduction:** Dietary diversity and the amount of animal source foods that an individual consume are two commonly used measures for dietary quality. Healthy growth and development essentially need a balanced diet of nutrients which includes a variety of foods from different food groups such as vegetables, fruits, grains and animal source. **Objective**: To assess dietary diversity and associated factors among high school adolescent girls in Gurage zone, southwest Ethiopia. **Methodology**: School based quantitative cross sectional study was conducted. The study included 634 adolescent girls. The sample was recruited using multistage cluster sampling technique. A dietary diversity score (DDS) and anthropometric of girls were measured. Bi-variable analysis was done to identify candidate variables for multivariable logistic regression and those variables having a p <0.25 was entered in multivariable logistic regression model. The results were reported by using Odds Ratio and 95% CI. P-value less than 0.05 were considered as statistically significant. **Results:** The mean dietary diversity score was 4.69±1.46. The prevalence of adolescents consuming less than or equal to three food groups was 20% and those consumed 3-4 food groups was 53.2% and those consumed greater than or equal to six food groups from nine food groups was 26.8%. Mother's education (AOR=3.44, 95% CI=1.04-7.29, P=0.24), monthly income of the household (AOR=1.56, 95% CI=1.28-1.9, P=0.001) and residence (AOR=0.8, 95% CI=0.1-0.9, P=0.21) were significantly associated with dietary diversity score. **Conclusion:** Dietary diversity score of high school adolescent girls was low in the study area.

Keywords: *dietary diversity, adolescents' girls, high school*

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1. Introduction

Dietary Diversity is defined as the number of different foods or food groups consumed over a given reference period [1]. Dietary diversity (DD) and the amount of animal source foods that an individual consumes are two commonly used measures for dietary quality. Healthy growth and development essentially need a balanced diet of nutrients which includes a variety of foods from different food groups (vegetables, fruits, grains and animal source foods). Monotonous diets (consumption of similar diet for longer time) based on starchy staples lack essential micronutrients and contribute to the burden of malnutrition and micronutrient deficiencies. Dietary diversity instruments have recently become the preferred method for studying dietary adequacy in developing countries [2].

Adolescence is a period characterized by rapid physical, emotional, social, sexual, and psychological development and maturation which in turn increases their requirements for energy, protein, and many vitamins and minerals.

These characteristics make adolescents vulnerable to a range of nutritional issues [3]. There are 1.2 billion adolescents between the ages of 10 and 19 in developing nations, from this half of them are girls [4]. While adolescents have typically been considered a low risk group for poor health, this ignores the fact that many health problems later in life can be improved or avoided by adopting healthy lifestyle habits in adolescence [5].

The major reason for focusing on adolescent girls is that this period of a child's life is a unique opportunity to break a range of vicious cycles of structural problems that are passed from one generation to the next, such as poverty, gender discrimination, violence, poor health and nutrition. Preparing for the demands of childbearing and breastfeeding is timely in adolescent girls and, above all, preventing premature pregnancy and its associated risk for both mother and child. Early intervention is particularly critical in adolescent girls whose nutritional status is marginal to begin with, so that they enter their first pregnancy in a better nutritional state [6].

In Ethiopia twenty seven percent of women had chronic energy deficiency (Body mass index < 18.5), 17 % of women were anemic, and 6 % of rural women are

experiencing night-blindness in their most recent pregnancy [7].

There are few studies in Ethiopia about dietary diversity and associated factors on adolescent girls. It is only recently that efforts, although small, have been made to include adolescent girls as beneficiaries in some of the health and nutrition intervention programs. Therefore this study aims to investigate dietary diversity and associated factors among adolescent girls in Gurage zone, southwest Ethiopia.

2. Methods and Materials

2.1. Study Design and Participants

We conducted a school based quantitative cross-sectional study from March to June 2016 in Gurage zone, southwest Ethiopia.Six hundred thirty four (634) selected adolescent high school girls participated in this study.

2.2. Source and Study Population

All adolescent high school girls in Gurage zone, southwest Ethiopia were source population. All selected adolescent high school girls in Gurage zone, southwest Ethiopia were study population. All adolescent girls who were free of physical disability like Kyphosis, Scoliosis, limb deformity or who were not pregnant were included as study participant.

2.3. Sampling Method and Criteria

Multistage cluster sampling was used to select the study participants. First five districts in Gurage zone were selected using simple random sampling from a total of 15 districts; then two sample high schools were selected by using simple random sampling method from each selected district; and finally after proportionally allocating sample size to each high school; adolescent girls were selected using cluster sampling technique.

2.4. Sample Size

The sample size of the study was calculated using single population proportion formula by considering the following assumptions: proportion of adolescents for bellow the mean score of dietary diversity among Ethiopian adolescent girls is 53% [7], margin of error as 5 %, confidence level at 95 %, non-response rate of 10 % and design effect of 1.5. The final sample size for this study was 634.

2.5. Variables of the Study

Dietary diversity score in adolescent girls were considered as dependent variables in this study. Adolescent Girls with dietary diversity score less than six food groups out of nine food groups were considered as low dietary diversity score. Those who have dietary diversity score greater than or equal to six food groups considered high. Socio-demographic variables, economic status, nutrition and cultural related characteristics were considered as independent variables.

2.6. Data Collection Instrument and Procedures

The data was collected by fifteen diploma clinical nurses who were recruited based on their competency for data collection. The interviewers were trained for two days before the actual data collection on interviewing approach, anthropometric measurement and data recording.

Weight of adolescent girls was measured using beam balance with light closing, and was measured to the nearest 0.1 kg, and height of adolescent girls was measured to the nearest 0.1 cm on standing position without shoes. Checking accuracy of the scale and frequent calibrating of the scale was done.

Dietary diversity was measured using the WHO & FAO one day diversity questionnaire. The diversity questionnaire used consists of 14 groups of foods, which covers almost every food taken. Some food groups in the dietary diversity questionnaire are combined into a single food group to create the dietary diversity score. In addition the questionnaire had a single question about any food or fast food consumed out of the house [8]. We evaluated one usual day in the week except holidays.

2.7. Data Quality Control

Data quality was controlled via conducting a pre-test on 5 % of the samples and through supervision during data collection. The completeness of the questionnaire was also checked before data entry. Anthropometric measurements of subjects were done by trained data collectors using standard procedures.

2.8. Data Processing and Analysis

Editing and sorting of the collected questionnaires was done manually every day to check for completeness. The completed questionnaire were coded and entered into a data entry template in epi-data version 3.1. After double entry verification, the data were exported to SPSS version 20.00 for analysis. Normality was checked for all continuous variables. Interaction between different independent variables was checked and colinearity diagnostics was done by checking the variance inflation factor. Means, standard deviations (SD) and percentages were used to describe the data and the results presented with narration, frequency tables and graphs. Bi-variable analysis was done to identify candidate variables for multivariable logistic regression then those variables having a p <0.25 was entered in to multivariable logistic regression model.The results were reported by using Odds Ratio and 95% CI. P-value less than 0.05 were considered as statistically significant. Wealth index was generated using a factor analysis called principal component analysis.

2.9. Ethical Consideration

Ethical clearance was obtained from institutional ethical review board of Wolkite University. Informed verbal consent was obtained from each study participant during data collection .Honest explanation of the survey purpose, description of the benefits and an offer to answer all inquiries was made to the respondents. Participant's right

to withdraw consent and discontinue participation without any form of prejudice was guaranteed. Privacy and confidentiality of participants information was ensured throughout the process.

3. Results

3.1. Sociodemographic Characteristics

A total of 634 high school adolescent girls completed the study giving a response rate of 100%. Larger proportions of participants (65.9%) were in the age group of 16-19 and the remaining (34.1%) were in the age group 13-15. Most (76.5%) of high school adolescent girls were Gurage. The majority (51.6%) of participants were Orthodox Christians. A little more than one third (32.6%) of participants were Muslim. Majority (71.5%) of them reside in rural area. Most of (88%) them were unmarried. Slightly over half (56.9%) of participants were in grade nine. (Table 1)

Table 1. Sociodemographic characteristics of high school adolescent girls in Gurage zone, south Ethiopia, 2016.

Socio-demographic variables		Frequency N=634
Age	14-15	216(34.1)
	16-19	418(65.9)
Ethnicity	Gurage	485(76.5)
	Amhara	119(18.8)
	Oromo	17(2.7)
	kenbata	6(1.0)
	Others	7(1.1)
Religion	Orthodox	327(51.6)
	Muslim	207(32.6)
	Protestant	63(9.9)
	Catholic	19(3.0)
	Others	18(2.8)
Residence	Urban	181(28.5)
	Rural	453(71.5)
Marital status	Married	72(11.4)
	Unmarried	558(88.0)
	Divorced	4(0.6)
Family size		
	1-4	100(15.8)
	5-10	522(82.3)
	>10	12(1.9)
Income		
	Low(< 500)	164(25.9)
	Middle(501-1000)	382(60.3)
	High(>1000)	88(13.9)

3.2. Family Related Information

Most (36.8%) of adolescent girls had mother who cannot read and write. Majority (57.3%) of mothers were housewife. Large proportions (31.1%) of adolescent girls had father who cannot read and write and most (63.1) of them are farmers. In majority (83.1) of households the head was father. In most (85.6%) of the households the type of food prepared was decided by the mother. Slightly over half of participants father were farmers. (Table 2)

Table 2. Family related information among high school adolescent girls in Gurage zone

variables		Frequency (634)
Mothers education		
	Unable to read and write	233(36.8)
	Able to read and write only	211(33.3)
	1-4	82(12.9)
	5-8	56(8.8)
	9-12	34(5.4)
	Diploma and above	18(2.8)
Mothers occupation		
	House wife	363(57.3)
	farmer	79(12.5)
	merchant	152(24.0)
	Daily laborer	10(1.6)
	employed	27(4.3)
	others	3(0.5)
Fathers education		
	Unable to read and write	197(31.1)
	Able to read and write only	140(22.1)
	1-4	90(14.2)
	5-8	105(16.6)
	9-12	58(9.1)
	Diploma and above	44(6.9)
Fathers occupation		
	Farmer	400(63.1)
	Merchant	99(15.6)
	Daily laborer	41(6.5)
	Employed	60(9.5)
	No job	19(3.0)
	others	15(2.4)
Head of household		
	Father	527(83.1)
	Mother	93(14.7)
	others	14(2.2)
Who decide the type of food prepared in home?		
	mother	543(85.6)
	father	24(3.8)
	children	52(8.2)
	other	15(2.4)

Just half (50.0) of them ate together with their family (same plate) and most (86.1%) of them had fixed time for eating meal. Slightly above half (56.47%) of them skipped meals. From these 64.52, 16.48 and 18.99 skip breakfast, lunch and dinner respectively. A number of reasons were given by the respondents for skipping meals. Majority of the respondents (68%) who skipped breakfast did so due to lack of time; either they woke up late, or they were late for school. Some (16%) indicated that they felt uncomfortable after eating breakfast; so they had decided to stop eating breakfast. Few (7%) of the participant mentioned lack of food as a reason for skipping meal.

3.3. Dietary Diversity

The mean dietary diversity score was 4.69±1.46. The prevalence of adolescents consuming less than or equal to three food groups was 20% (127) and those consumed 3-4 food groups were 53.2% (337) and those consumed greater than or equal to six food groups were 26.8% (170).

From those who were underweight most (78.7%) of them consumed less than six food groups and from those who had normal body mass index (BMI) most (73.3%) of them consumed less than six food groups. (Table 3)

Table 3. Distribution of dietary diversity (DDS) and its relationship with body mass index among high school adolescent girls

| | DDS | | total | P-value |
	<6	>=6		
Underweight	85(78.7%)	23(21.3%)	108	
Normal	360(73.3%)	131(26.7%)	491	0.018
Overweight	19(54.3%)	16(45.7%)	35	

DDS= Dietary diversity.

From the nine food groups 96.2%, 64.8%,84.5%,65.6% and 73.3% of the participants consume starchy food, vitamin A rich fruits and vegetables, other fruits and vegetable, green leafy vegetables, and legumes respectively. Consumption of meat and fish, organ meat, egg and milk and milk products was 23.3%, 95.9%, 72.4% and 70.3% respectively

3.4. Predictors of Adolescent Girl's Dietary Diversity

The odds of having low dietary diversity was 1.56 (1.28-1.9) times higher among adolescents who earn less than five hundred birr per month (1 USD =22.8379ETB) than adolescents who have greater than one thousand. Mother's education is also important predictor of dietary diversity. Adolescents with a mother who can only read and write were, 3.44 (1.04-7.29) times more likely to have low dietary diversity than a mother who have diploma and above. Adolescents living in urban area were 0.8 times less likely to have low dietary diversity than those living in rural area.

4. Discussion

Dietary diversity score is one of best indicators of both macronutrient and micronutrient intake. This study showed that the mean dietary diversity was 4.69±1.46 which is consistent with a study conducted in Kaduna province of Nigeria among adolescents using the 24- hour recall questionnaire [9]. While this is slightly lower than previous studies conducted in Ethiopia, Iran and Filipino [7,10,11]. This could be due to the low awareness regarding diversification of diet seen in this study or it could be because of the difference in sample size among these studies. In this study only 26.8% of the participants ate 6 or more food groups. This result is similar with the result of another study conducted in Ethiopia [7].

Table 4. Predictors of dietary diversity among high school adolescent girls

| variables | Low dietary diversity | | crude OR | Adjusted OR |
	yes	No		
Income				
<500	139	25	1.85(1.2-2.0)	1.56(1.28-1.9)*
500-1000	259	123	0.7(0.8-2.41)	1.48(0.84-2.61)
>1000	66	22	1	1
Mother education				
Unable to read and write	189	44	1.2(0.2-2.5)	1.5(0.4-5.2)
Can only read and write	180	50	1.03(0.54-5.36)	3.44(1.04-7.29)*
1-4	56	26	0.62(0.48-5.42)	2.79(0.8-9.6)
5-8	41	15	0.78(0.36-4.5)	1.96(0.54-7.05)
9-12	22	12	0.5(0.5-7.11)	2.2(0.5-8.31)
Diploma and above	14	4	1	1
Residence				
urban	115	66	0.51(0.3-0.7)	0.8(0.2-0.9)*
rural	349	104		1

In the present study, majority (96.2%) of girls consumed cereal which is consistent with a study conducted in Ghana which shows mostly consumed foods were cereals and cereal product [12]. This could be due to high production and availability of cereal based foods. This could also be due to the cultural preference of those foods. The questionnaire included a question about fast food consumption. Around 80% of the participants claimed that they did not consume fast food in the last 24 hours which is consistence with a study conducted in Iran [10]. The reason could be due to mothers of most students' were housewives which might have contributed to the lower consumption of fast foods by students.

But breakfast is very important especially among adolescents who are still in school. This study showed that 64.52% of the respondents skipped breakfast which is consistent with other study in Ghana [12]. Breakfast is considered important because it has a role in alleviating short-term hunger thereby improving cognition, short term memory and concentration.

The current study revealed that adolescent girls with higher DDS were not significantly associated with BMI which is inconsistent with other study in Ethiopia [7]. This could be because higher DDS is not always associated with increased weight gain, because it may due to the increase in consumption of low calorie food such as vegetables, whole grains and fruit.

There was a significant relationship between the DDS and monthly income of the family. Those households with low monthly income are more likely to have low dietary diversity. This is similar with a study conducted in Iran; they found that; there were significant association between DDS and economic status of the family [10]. This could be due to the reason behind poor people often do not have adequate access to a diverse food. Although access is important, but the awareness of food-based dietary guidelines will probably have more effect. Furthermore, it is evident that food diversity needs greater cost.

This study revealed that those who lived in urban area had higher dietary diversity than who lived in rural. This result is consistent with a study in Mali showing similar result [13]. The reason could be due to urban settings have a greater availability and access of selection of foods. They also have great access to well stablish markets where diversified foods could be available.

Adolescent girls who had educated mother consumed more diversified diet than adolescents with less educated mothers. This is similar with other study which shows adolescents whose mother was more educated were more likely to consume protein and cholesterol diet. The reason could be in most areas the role of food preparation and serving is given for females. So this gives them a power to decide the quantity and quality of food that will be prepared in the household. Awareness about diversification of food could be related with their educational level.

5. Conclusion

The mean dietary diversity of high school adolescent girls was low. The prevalence of low DDS (>6 food groups) was high. Mother's educational level, monthly income of household and residence were significantly associated with dietary diversity of adolescent girls. Considering adolescent girls as one of major target groups for community based nutrition recommended. It's better to give training to health extension workers about diversification of diet and its health benefits. Strengthening school education in Gurage zone regarding nutrition is also helpful to increase dietary diversity of adolescents in the area.

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